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# Worm Mistletoe Infection In Ponderosa Pine

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## Southwestern Dwarf Mistletoe



Most Southwestern conifers are parasitized by dwarf mistletoes, flowering plants that depend on their hosts almost completely for water and nutrients. Dwarf mistletoes are related to true mistletoes, or Christmas mistletoes, which are found in hardwoods such as oaks and cottonwoods. A few conifers, such as juniper, are host to these *true* mistletoes, but no hardwood species is infected by a *dwarf* mistletoe.

Dwarf mistletoes are smaller, leafless, and infection is more damaging than true mistletoes. They slowly weaken and eventually kill the host tree. There are many different species of dwarf mistletoe, all belonging to the genus *Arceuthobium*, and generally each one infects a specific tree species. True mistletoes belong to the genus *Phoradendron* and their host range is typically broader. A list of dwarf and true mistletoes found in Arizona and New Mexico is provided in the table on the back panels.

Southwestern dwarf mistletoe, which grows on ponderosa pine, is the most damaging and prevalent dwarf mistletoe in the Southwest. It weakens and kills infected ponderosa pines and spreads to neighboring host trees. This pamphlet describes the disease caused by Southwestern dwarf mistletoe, how it spreads and kills trees, and how to detect and control infection. Most of this information also applies to the other species of dwarf mistletoe occurring in other Southwestern conifers.



Explosively discharged seeds

## Life Cycle

Dwarf mistletoe plants are either female or male. Although both plants cause disease, it is only female plants that produce seeds that infect other branches on the same tree or surrounding host trees.

The seeds of dwarf mistletoe are produced in a berry. Pressure builds up inside the berry as seeds mature from late July to early August. The berry falls away from the shoot as the seed is explosively discharged at about 60 miles per hour. A seed may travel as far as 40 feet, but the usual distance is 10-20 feet.

Dwarf mistletoe seeds have a sticky coating that allows them to adhere to substrates on which they land. Infection occurs when seeds, that have landed on needles, absorb water and travel down to the young stem tissue.

Dwarf mistletoe infection begins with development of a root-like (endophytic) system that grows in the outermost layer of host tissue. The first sign of infection is a swollen area on the stem. About two years after infection, aerial shoots develop at the site of infection and two years later, fruits mature on the female plants. An aerial shoot continues to flower and produce fruit for about 4-5 years until the plants naturally fall off. New shoots are produced from the endophytic system, which survives and continues to grow with each new year's growth of the host. An older infection is readily recognized because the branch becomes very dense and misshapen, forming what is called a "witches' broom."

## Effects

Dwarf mistletoes are natural components of many forest ecosystems in the West. As parasites, dwarf mistletoes slowly weaken and eventually kill

infected trees which are drained of water and nutrients. The younger a tree is when it becomes infected, the more likely

dwarf mistletoe infection will intensify to the point of either killing the tree directly or predisposing it to attack by secondary bark beetles.

Dwarf mistletoes also provide forage for many species of birds and mammals, and the witches' brooms they cause serve as excellent nest sites. As groups of trees are killed by dwarf mistletoes, the microclimate and vegetation composition of the openings are affected. Some of the changes in forest





structure brought about by dwarf mistletoes, but may not be desirable to land managers or homeowners.

## Identifying Infection

Southwestern dwarf mistletoe on ponderosa pine is readily identified by witches' brooms, yellow-orange shoots growing from infected stems, and branch swellings from latent infections which have not produced shoots.

## Prevention and Control

Wildfires are one of the primary natural control methods of southwestern dwarf mistletoe. Relatively complete burns have a sanitizing effect in infected forests, while partial burns lead to rapid infection of regeneration due to the scattered infected trees that remain following fire. Dwarf mistletoe infected trees suffer more crown scorch than healthy trees because of flammable witches brooms and lower crowns, and heavily infected trees have less than half the probability of survival compared to uninfected trees.

To mimic the natural control strategy, prescribed fire can be introduced into dwarf mistletoe infected forests where practicable. That is, frequent low intensity fire regimes can be used to kill some of the lower branch infections and prevent host seedlings from becoming established.

There are other options for controlling the spread and intensification of dwarf mistletoe infection, especially near homes where trees are of high value and using fire is not an option. For example, the most severely infected trees can be removed as a way of decreasing the amount of dwarf mistletoe in the area. This action also improves the health of residual trees by reducing competition for limited resources, such as water and nutrients. Another option is to plant non-host species under infected trees to allow for tree replacement when infected trees die.

Pruning infected limbs is an option for high value trees. There are two approaches to pruning trees infected with dwarf mistletoe: removing all infected branches, or removing only the large witches' brooms. In the first approach, branches are cut two whorls above the uppermost infected branch to insure removal of latent infections. Trees should have at least a 30 percent live crown remaining after pruning. Cutting out only the large witches' brooms, typically located at the bottom of the tree, will prolong the life of the tree since the nutrient sinks



*Dwarf mistletoe slowly kills infected trees.*



*ected trees.*

are removed. This is the approach to use when too much of the crown is infected to remove all infected limbs.

The spread of dwarf mistletoe can be temporarily halted by applying a plant growth regulator called Ethephon (Chipco Florel Pro<sup>®</sup>), which causes aerial shoots to prematurely fall off from branches. Ethephon treatment does not kill mistletoe infection since the endophytic system is unaffected. Effects of ethephon are temporary; new shoots and eventually new fruits and seeds develop from the living endophytic system 1-2 years after treatment. Repeated treatments would be necessary to prevent further spread of mistletoe. In all control approaches mentioned, followup treatments are advised.



*Pruning out witches' brooms in heavily infected dwarf mistletoe trees will increase the longevity of the tree (before pruning, left, and 6 years later, right).*





## Principal Hosts and Distribution of Dwarf Mistletoes and True Mistletoes in Arizona and New Mexico

Common Name	Species Name	Principal Host
<b>DWARF MISTLETOES</b>		
Southwestern dwarf mistletoe	<i>Arceuthobium vaginatum</i> subsp. <i>cryptopodum</i>	Ponderosa pine, Apache pine, and Arizona pine
Chihuahua pine dwarf mistletoe	<i>Arceuthobium gillii</i>	Chihuahua pine
Piñon dwarf mistletoe	<i>Arceuthobium divaricatum</i>	Pinyon
Douglas-fir dwarf mistletoe	<i>Arceuthobium douglasii</i>	Douglas fir
Apache dwarf mistletoe	<i>Arceuthobium apachecum</i>	Southwestern white pine
Western spruce dwarf mistletoe	<i>Arceuthobium microcarpum</i>	Engelmann spruce, Blue spruce, and Bristlecone pine
True fir dwarf mistletoe	<i>Arceuthobium abietinum</i>	White fir
<b>TRUE MISTLETOES</b>		
	<i>Phoradendron macrophyllum</i>	60 species of hardwood, except oaks
	<i>Phoradendron coryae</i>	Oak species
	<i>Phoradendron californicum</i>	Leguminous trees and shrubs
	<i>Phoradendron juniperinum</i>	All juniper species
	<i>Phoradendron capitellatum</i>	Utah, alligator, and red-berry juniper
	<i>Phoradendron densum</i>	Arizona cypress
	<i>Phoradendron pauciflorum</i>	White fir

Pesticides used improperly can be injurious to human beings, animals, and plants. Follow the directions and heed all precautions on labels. Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides where there is danger of drift when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment, if specified on the label.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

NOTE: Some states have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your local forest pathologist, county agriculture agent, or State extension specialist to be sure the intended use is still registered.



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**For more information about these parasitic plants,  
contact:**

### **State and Private Lands**

#### **Arizona**

Arizona State Land Department  
Division of Forestry  
1616 West Adams, Rm. 100  
Phoenix, AZ 85007  
Telephone: (602) 542-2517

#### **New Mexico**

NMSU Extension Forest Entomologist  
EMNRD Forestry Division  
P.O. Box 1948  
Santa Fe, NM 87504  
Telephone: (505) 827-5833

### **Federal Lands**

#### **Arizona**

USDA Forest Service  
Arizona Zone Entomology  
and Pathology  
2500 S. Pine Knoll Drive  
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Telephone: (520) 556-2075

#### **New Mexico**

USDA Forest Service  
New Mexico Zone Entomology  
and Pathology  
123 4th Street, SW, Room 212  
Albuquerque, NM 87102  
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